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(54) **Public transport system.**

(57) A public transport system comprising means of transport accessible to the public at a charge, said means in operation travelling predetermined routes operated by one or more operators, with predetermined stops; and sales locations for transport tickets. At least a plurality of passengers are provided with a registration means comprising readable and writable memory means. Further, devices are provided by means of which a passenger can store the distance travelled by him in the memory means of the registration means, and means for determining the selling price of a next transport ticket on the basis of the travelled distances stored.

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The invention relates to a public transport system and more in particular a settlement system wherein the wishes of both the passenger and the public transport companies in question can be taken into account.

In public transport systems it is important that the participating transport companies (operators) can have the disposal of information about the travel behaviour of passengers, because by means of this information, the transport services rendered by the different operators can be measured. On the basis of the transport service rendered, the proceeds of a transport ticket can then be settled between the companies that have rendered a service for account of this transport ticket.

A service in this sense may for instance be the sale of the transport ticket in question, or taking care of the transport or a part of the transport on the route and/or for the period for which the ticket in question is valid.

In order that this settlement can take place in an accurate manner, it is necessary to register the means of transport, for instance train, bus, underground or taxi, the relevant companies or institutions, and the portion of the total journey travelled for account of a specific type of transport ticket. For this purpose, therefore, preferably, the get-on point, the get-off point, the company as well as the time of getting on and off and, if applicable, transferring, should be registered.

In the current public transport systems, this registration only takes place to a very incomplete extent, if at all. Particularly when a transport ticket allows transport over different routes and/or by different means of transport, and/or if a season ticket for a predetermined period is involved, an exact registration of the transport possibilities that have actually been used is very difficult to realize. Settlement between the various companies usually takes place on the basis of sales information and a random check for a relatively short period and hence is not likely to be very representative of the total annual transport services rendered. The problem of "dodge faring", too, may give rise to a considerable difference between the transport services rendered and the payment to be received by the transport company for such registered transport service.

Further, apart from the registration problem and the resulting problem of the settlement between the various operators, the use of season tickets, in particular of longterm season tickets, has the drawback that the passenger must decide in advance whether he/she will make frequent use of the public transport for a future period which is sometimes long. Moreover, in that case, the passenger must also pay the amount for the season ticket, which is often considerable, in advance,

while at that moment it is not certain whether the eventual, actual use of the public transport system does in fact justify the costs of such season ticket.

Because the registration of both the get-on point, the transfer point, if any, and the get-off point will be regarded by the travelling public as rather inconvenient and burdensome, it is important that the public transport system be designed such that registration also has attractive sides to the passenger but need not be made compulsory.

The object of the present invention is to provide at least a partial solution to these problems.

According to the invention, a public transport system comprising means of transport accessible to the public at a charge, which means of transport travel, in operation, predetermined routes operated by one or more operators, with predetermined stops; and sales locations for transport tickets, is characterized in that at least a number of passengers are provided with a registration means comprising readable and writable memory means; that devices are provided by means of which a passenger can write the distance travelled by the passenger in the memory means of a registration means presented by the passenger, while this distance is added in the memory means to a previously registered distance, if any; and that the sales locations are provided with means for reading the total distance registered in the memory means of a registration means and for determining, on the basis of the total distance, the selling price of, and/or the reduction on, a next transport ticket.

It is observed that a public transport system which is so designed that each passenger is both checked in at the beginning of the journey and checked out at the end thereof, is disclosed in EP-A-0 465 456. However, in this known public transport system, no registration means are used that are carried by the passengers themselves and in which the travelled distance can be registered each time. Further, the known public transport system comprises a dense network of communication connections between the means of transport, which are provided with primary registration means, collecting centres and a central processing system. Such a dense communication network is difficult to install, susceptible to failure and at any rate quite costly.

The invention will be explained in more detail hereinafter.

The starting point is that the new public transport system, and in particular the tariff system used, should be made attractive to the user, i.e. the passenger. The information desired by the transport companies for business efficiency and for logistic purposes must result from this without frequent registration being made compulsory.

In a public transport system according to the invention, registration of the transport service en-

joyed, in the form of travelled kilometers, rendered by one or several public transport companies, is promoted by a reduction mechanism according to which more reduction is given according as more kilometers have been travelled. This reduction includes every form of public transport used, for which the passenger himself has registered the starting point, the transfer point(s), if any, and the end point. Possibly, if the route is known in advance, it could suffice to register the starting point alone.

In this connection, the total amount of kilometers travelled by a passenger is for instance added in the registration means and stored in a memory per period of time, for instance per week or per month. Accordingly, on the basis of the travelled distance, for instance in the form of the progressive average of the amount of travelled kilometers per period, a reduction to be given can be calculated when a next transport ticket is sold. Hence, preferably, registration of the travelled distance also includes registration of time information (for instance date, hour, minute, second). In order for the amount of travelled kilometers to be included in the basis of reduction, it is possible to book out within a specific period after the journey has ended, or the distance or the number of zones to be travelled should be stated in advance or be known by the type of transport ticket. Hence, season ticket holders who travel incidentally will have to pay more, relatively speaking, because fewer travelled kilometers are collected and the basis of reduction will therefore be lower. This is not without reason, because non-used transport capacity must be kept available for this group.

For registration, book-off and registration units can be used, which may for instance be located on platforms, in trains, buses and trams and at the entrances and exits of the underground. Registration need not be compulsory for season ticket holders, but it does afford the passenger a reduction when a next or supplementary travel pass is bought. Consequently, the passenger will generally like to register as much as possible to thereby obtain a higher basis of reduction.

In order to promote booking out in the case of zone/km tickets as well, when the number of zones is stated during booking, it is possible to book the minimum distance in kilometers valid for this number of zones for the basis of reduction. However, if booking out takes place as well, the actual transport service in kilometers can be booked for the basis of reduction, which is normally more than the travelling distance determined on the basis of the zones booked. However, in this case the tariff must not be adapted, as this would encourage premature booking out, and hence fraud. When booking out does take place, in the event where too few zones

have been booked, correction does take place. In the case of booking without statement of the number of zones to be travelled, it is also possible to book off the maximum number of zones that are still possible on the line in question, after which the amount to be paid as well as the travelled distance are corrected during booking out.

In order to avoid the allocation problem as much as possible, it is advantageous to use route season tickets, while the distribution code for the distribution of monies between the transport companies can be predetermined at the sale, independently of the travelling frequency, and can optionally be corrected with the measured number of fare dodgers. Measuring the number of fare dodgers can for instance be carried out by using counting steps or other detection means with which the total number of passengers getting on and off is counted, and comparing the outcome of this count with the number of bookings or registrations that have taken place.

Underground lines could be closed off entirely, so that when they are entered and left, it automatically becomes possible for the passenger to check in and check out.

Preferably, network season tickets are replaced as much as possible by transport tickets for fixed routes or transport tickets for shorter distances, while eventually, due to a constantly increasing reduction when more kilometers are travelled, prices are paid that do not exceed the current prices for transport on the network. Consequently, the reduction scale should be thus progressive that the passenger never pays more than the price of a network year ticket.

For registering the travelled kilometers for instance a contactless smart card may be used, as described, for instance, in applicant's European patent application 0 534 559.

Such card, or generally the registration means, may also form the transport ticket itself, as described for instance in German Offenlegungsschrift 3 911 667 (Bosch), but it is also possible to use the registration means for registration only and, in addition, to use separate tickets for single use. The registration means can be provided with a unique identification code, uniquely coupled to the holder. The registration means can have a value which can be increased through payment of an amount of money, or can be designed as a conventional credit card or cheque card.

Accordingly, the sales locations may be provided with corresponding pay and/or value-increase machines.

The registration means and, optionally, the transport ticket, may be a chip card with contacts according to the standard ISO 7816, or, conversely, may be a contactless responder card. The advan-

tage of a contactless responder card is that the contactless registration possibility enables very quick registration and that because of the lack of moving elements in the reading devices and writing devices, the maintenance costs are much lower. A combination of the two designs is also possible, whereby the issue and, optionally, value-increasing could be effected via contacts, while the registration, together with the booking of the travelled distance, could be effected in a contactless manner. Obviously, it is also possible to use a magnetic card, or a registration means comprising other types of memory means. By decentralized registration of the number of travelled kilometers per transport ticket in the registration means or transport ticket in this manner, this information is directly available at all times and no communication with a central computer system is required.

As a result, a greater privacy of the passenger can be guaranteed as well.

#### Claims

1. A public transport system comprising means of transport accessible to the public at a charge, said means in operation travelling predetermined routes operated by one or more operators, with predetermined stops; and sales locations for transport tickets, characterized in that at least a plurality of passengers are provided with a registration means comprising readable and writable memory means; that devices are provided by means of which a passenger can write the distance travelled by the passenger in the memory means of a registration means presented by the passenger, said distance being added in the memory means to a previously registered distance, if any; and that the sales locations are provided with means for reading the total distance registered in the memory means of a registration means, and for determining, on the basis of the total distance, the selling price of, and/or the reduction on, a next transport ticket.
2. A public transport system according to claim 1, characterized in that the registration means has the form of a card and that the memory means can be read and written electronically and/or magnetically.
3. A public transport system according to claim 1 or 2, characterized in that the registration means consists of a chip card.
4. A public transport system according to claim 3, characterized in that the chip card is a contactless chip card.
5. A public transport system according to claim 3 or 4, characterized in that the chip card is provided with contacts according to the standard ISO 7816.
6. A public transport system according to any one of the preceding claims, characterized in that the registration means is provided with means for determining from the registered distances a progressive average per predetermined period of time and storing said progressive average in the memory means.
7. A public transport system according to any one of the preceding claims, characterized in that the registration means is provided with a unique code associated with the holder.
8. A public transport system according to any one of the preceding claims, characterized in that the registration means also forms the transport ticket.
9. A public transport system according to any one of the preceding claims, characterized in that the registration means has a money value which can be increased through payment of an amount of money.
10. A public transport system according to any one of the preceding claims, characterized in that the registration means is also designed as a conventional credit card.
11. A public transport system according to any one of the preceding claims, characterized in that the devices for writing travelled distances in the memory means of a registration means comprise check-out means located at the get-off points of the public transport system.
12. A public transport system according to any one of the preceding claims, characterized in that the devices for writing travelled distances in the memory means of a registration means also write time information in the memory means.
13. A public transport system according to any one of the preceding claims, characterized by detection means for counting the number of passengers getting on and off.

14. A method for operating a public transport system with one or more operators, characterized in that at least a plurality of passengers are provided with a registration means comprising readable and writable memory means, and that devices are provided by means of which a passenger can write the distance travelled with the public transport system in the memory means of his registration means, and that at the sales locations of transport tickets, the total travelled distance registered in the memory means of a registration means presented by the passenger is read and used for determining the selling price of, and/or the reduction on, a next transport ticket.
15. A method according to claim 14, characterized in that the travelled distance is determined per period of time and that on the basis thereof the selling price of, and/or the reduction on, a next transport ticket are determined.

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## EUROPEAN SEARCH REPORT

Application Number  
EP 93 20 3096

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
Y	EP-A-0 380 377 (URBA 2000) * column 2, line 25 - column 7, line 6 * * claims; figures * ---	1-4,7-14	G07B15/00 G07F7/00
Y,D	EP-A-0 465 456 (SOCIETE REGIONALE WALLONNE DU TRANSPORT) * column 1, line 56 - column 2, line 47 * * column 4, line 48 - column 6, line 8 * * claims; figures * ---	1-4,7-14	
A	GB-A-2 191 029 (ALMEX SYSTEMS) * page 1, line 30 - page 3, line 30; figures * ---	1-4,7-15	
A,D	DE-A-39 11 667 (BOSCH)  * column 1, line 8 - column 3, line 39; figures * ---	1-3,7,8, 12,14	
A	VEHICLE NAVIGATION & INFORMATION SYSTEMS CONFERENCE PROCEEDINGS, 1 October 1991, WARRENDALE, PA, USA pages 977 - 987 KOMANECKY 'IVHS Applications of smart cards' * page 978, column 1, line 12 - page 979, column 1, line 6 * * page 986, column 2, line 23 - page 987, column 1, line 17; figures * ---	1-4,6,8, 14	TECHNICAL FIELDS SEARCHED (Int.Cl.5)  G07B G07F
A	EP-A-0 373 036 (SEXTANT AVIONIQUE) * column 2, line 6 - column 3, line 21 * * column 6, line 25 - column 7, line 6 * * claims; figures * --- -/-	1,2,8,14	
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>21 February 1994</b>	Examiner <b>Meyl, D</b>
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document  T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			



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Application Number  
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CLS)
A	WO-A-90 03016 (REGIE AUTONOME DES TRANSPORT PARISIENS) * page 3, line 25 - page 5, line 8; claims; figures * ---	1-5, 8-10, 14	
A	GB-A-2 142 178 (DOYLE) ---		
A	DE-A-34 25 524 (FIEDLER) -----		
			TECHNICAL FIELDS SEARCHED (Int.CLS)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 February 1994	Examiner Meyl, D
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- @ : member of the same patent family, corresponding document	